PEST TECHNOLOGY
Pest Control and Pesticides

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CONTENTS

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AIR LIFT

THIS YEAR a great deal of publicity has been given to the use of aircraft for the application of spray chemicals. Recent events in this field have included, "Operation Down-Wash" a demonstration of aerial spraying and fertiliser spreading, given by Fison-Airwork in Norfolk, "The Place of Aircraft in Agriculture," a film show and discussion arranged by Frank Pertwee & Sons Ltd. and held at Colchester. F. W. Berk & Co. Ltd., and others have also given recent publicity to this increasing interest in the use of aircraft.

We must not be misled by all this publicity into believing that aerial spraying has been suddenly sprung upon us, indeed Fisons have been crop spraying contractors for the past eleven years and for a number of years aerial spraying has been carried out successfully and economically in a variety of overseas countries. In New Zealand particularly there is scope for all the year round use of aircraft in agriculture and it has been reported from Czechoslovakia that the most economic and advantageous way of protecting hop gardens against the hop aphid was the use of a cold aerially applied systemic aerosol.

No one can doubt the obvious advantages of aerial spraying particularly when the ground is wet and ground sprayers cannot operate efficiently if at all. In this case the use of aircraft is the only feasible alternative. The speed with which a large acreage can be sprayed using aircraft is all important where serious outbreaks of pests are threatened.

Why is it then that, in this respect, British agricultural practice appears to be lagging behind that of overseas countries? One can find several reasons for this, first and foremost being the cost, but it has been pointed out that if the use of aircraft became more widespread (enabling the aircraft to be used for the greater part of the year) the cost would be reduced. Although, when directly compared, the cost of aerial application would still be dearer than that of conventional methods, it may prove more economical when taking into consideration the fact that there is less crop damage and less time taken.

In the past it has been felt that aerial spraying could only be carried out on large acreage crops such as potatoes and sugar beet. While this is still true to some extent the use of helicopters has shown that smaller acreages which may also be difficult to get at because of surrounding obstructions such as hills, buildings, trees and telegraph poles, may be successfully and accurately covered. The accuracy which can be obtained by helicopter spraying is a big help in solving the spray-drift problem. Regarding the latter, formulation is of great importance and a great deal of research is required. Perhaps the experiments with "inverted" formulations may be the first step towards the solution of this problem.

One point seems to stand out in all this publicity, there seems to be no plane specifically designed for crop spraying, the aircraft used appear to be adaptable fixed-wing aircraft such as the Tiger Moth and Auster, plus the highly versatile helicopter. It therefore appears reasonable to assume that an aircraft designed specifically for crop spraying would be of immense value.

PFLANZENSCHUTZ

An account developed from information received as a result of a two-day Press Visit to the Farbenfabriken Bayer works at Leverkusen and Wuppertal-Elberfeld, Western Germany.

"PEST TECHNOLOGY" was naturally interested in the Press Visit to Farbenfabriken Bayer A.G. arranged by Baywood Chemicals Limited. As the Bayer works are the birthplace of the organo-phosphorous insecticides "Pest Technology" was represented in the hope of gaining some information on new products in this field. However, no account of this firm would be complete without at least some indication of the wide field covered by Bayer products or the vast organisation required to cover this field.

The company employs 52,000 people and of these 31,000 are employed at Leverkusen, which could be described as a community rather than a factory as there is a village complete with shopping centre built by the company for the employees. Other workers are employed at Uerdingen, Dormagen, Wuppertal-Elberfeld and the Agfa Camera works at Munich.

Aerial view of the main works at Leverkusen.

A brief description of the goods manufactured by the company was given by Dr. Loehr who divided the products into six main lines.

(1) Bulk chemicals such as sulphuric acid and caustic soda.

(2) The manufacture of dyestuffs and auxiliaries with which this flourishing concern started.

(3) Pharmaceuticals. Here it is interesting to note that the head of the Research Institute for Pathology and Bacteriology is Prof. G. Domagk who was awarded the Nobel Prize for Medicine in 1939 for his discovery of the anti-bacterial action of the sulphonomides. Prof. Domagk is at present concentrating on medicaments against cancer.

(4) The production of synthetic fibres, rubber and plastics.

(5) The production of Agfa photographic materials.

(6) The development of Plant Protection chemicals.

It is with this latter field that we are naturally interested.

The Crop Protection Laboratory is under the direction of Dr. G. Schrader and his assistant Dr. Lorenz. A number of insecticides have originated from this laboratory one or two outstanding examples being "Parathion"

developed in 1944, "Systox" developed in 1951 and "Metasystox" and "Dipterex" developed in 1952, all of which are widely known.

Despite the number of insecticides marketed only one in thousands of the chemicals tested is passed as suitable. The development of a new pesticide may involve years of research and a considerable expenditure in both energy and capital.

The pesticides are tested for their efficiency, toxicity to man, domestic animals and plants. They are also tested for their effect on game and predators of the pest and also for their residual properties.

This present-day research requires the employment of highly qualified teams of scientists and laboratories equipped with the most up-to-date appliances as well as a wide range of knowledge and experience.

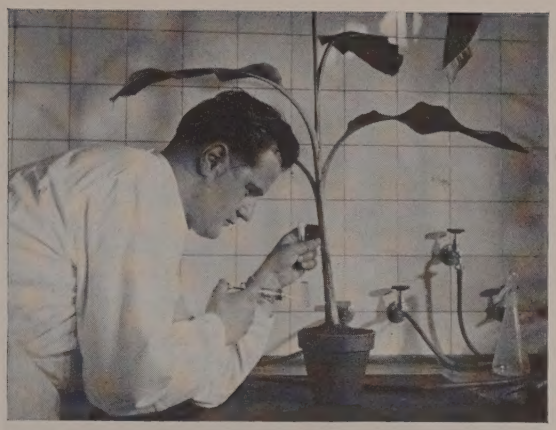
It is in this field of modern research that the Bayer Company can really excel. Let us take knowledge and experience, one has only to mention the names of Dr. Schrader and Dr. Lorenz to realise how competently this aspect is covered. In addition there are, under the leadership of Dr. Schrader, teams of scientists and technicians who are highly qualified in their own right. To keep abreast of modern developments in the plant protection field these research workers can refer to the well stocked library at Leverkusen.

From the crop protection laboratory at Elberfeld, where the pesticide is first synthesised, to the research stations and experimental farms situated in various parts of the world and where the product can be tested on a commercial scale, the scientists can take advantage of the most up-to-date appliances and methods.

Let us follow the stages in the development of a pesticide commencing with its synthesis at the laboratory at Elberfeld, where there is also a pilot-plant from which the cost of production can be worked out if the pesticide succeeds all the stages in testing.

One of the first stages in the testing of the substance is carried out at the Public Health Laboratory in Elberfeld where tests on the mammalian toxicity are carried out by doctors and pharmacologists, who work in collaboration with medical experts of the German Federal Ministry of Health, to ensure that no products are introduced onto the market which are dangerous or harmful to the users. Workers on this and other stages in the development of a pesticide and indeed from all other departments of the Bayer concern can take advantage of the magnificently equipped Isotope Laboratories which are situated at Elberfeld.

In these laboratories every precaution is taken to ensure that workers are not subjected to harmful doses of radiation and to ensure that no out-going waste, either to the atmosphere or into the river, is contaminated.



A chemist injecting a radio active substance into a plant. This method is used to trace the flow of an experimental chemical through the plant system.

Isotopes can be used in a variety of ways most of which are well known, in this case, however, they are mainly used as tracers. By using radio active isotopes to label a substance, say our pesticide, one can determine the course it takes through an animal or plant; whether it is changed chemically and its residual effect, all of which, especially the latter, are important points to know. The sensitivity of this method can be judged from the fact that with a modern geiger counter it is possible to determine 0.000,000,0001 gramme of an isotope.

From the laboratory at Elberfeld the pesticide is passed to the Biological Institute at Leverkusen where it is tested for its toxicity to plants and animals, tested to find the correct dosage and its compatability with other insecticides. Needless to say the dosage at which a pesticide is effective against a pest must not be harmful to the crop plant.

Pests of widely varying species including Red Spider, Aphids, Mosquitoes, Flies, Locusts, Rats, Mice, Weeds and Fungus are kept and bred at the Institute not only to test the efficiency of various doses of pesticide on various stages in the life cycle of a pest but also to study the biology of the pest in order to improve methods of control.

Certain laboratories are set aside solely for research on the control of insects; other laboratories deal with fungal diseases of plants. Chemical weed control also has a laboratory of its own and it is heartening to note that there is a laboratory specifically concerned with research on eelworms.

Substances which prove effective in the laboratory are then given more extensive tests in the greenhouses annexed to the Biological Institute. The climatic conditions of various parts of the world can be similated in these greenhouses which are among the best in Europe.

Aerial view of the Bayer Plant at Wuppertal-Elberfeld. Research is centralised here. The works include the Isotope Laboratory and the Crop Protection Laboratory.

If the pesticide survives these tests it is passed to the formulating laboratory to find the most effective formulation whether emulsion, suspension or dust etc.

After formulation it is ready for full scale field trials on one of the several research stations owned by the company. Even at this stage of the development the pesticide may be discarded for some reason or other, however, if it is successful it is passed to a competent ministry for approval before being marketed. The product is then passed on to the salesmen.

On the question of new products being developed any company is naturally cautious with its answers not so much from the fear that another firm may " beat them to the punch," for in any case the product will have been patented, but because the product may be rejected at the eleventh hour.

Of the Bayer products " Parathion " and " Systox " are now well known, " Metasystox," used on a large scale on the sugar beet crop and " Dipterex," have been on the market for several years. However with regard to the latter two it may not have been noticed in certain circles that they are both partly specific, particularly with regard to bees. " Metasystox," for instance, though it will kill bees on contact is not normally sprayed when bees are flying, also it is a systemic insecticide and is only effective as a contact insecticide for a short time after application. Bees cannot be killed by the systemic effect as " Metasystox " is not translocated to the nectar.

" Dipterex " is quite specific with regard to bees and though it may be lethal to a small percentage (5%) of bees coming into contact with it, it is harmless to the majority in the dosages normally used.

New products not yet on the market generally are; " Azuntal " for which trials indicate that it may be useful in the control of cattle ticks in sub-tropical and tropical countries; " Neguvon " which has proved successful for the control of warbles, mange mites and other ectoparisites of cattle and domestic animals; " Gusathion " already being used in America under the trade name " Guthion " for use on fruit and cotton.

At present " Neguvon " is not commercially available in this country, however, field tests are at present being carried out by Cooper McDougall & Robertson. Data from tests in other countries show that " Neguvon " can be applied orally or as a wash. It can be used for the control of warble fly larvae in cows and young cattle, cattle and pig mites (Sarcoptic mange) as well as lice and trichodectes infestations of domestic animals.

Oral administration is best carried out using a balling gun though it can be given to pigs with the food.

For the control of subcutaneous warble fly larvae in young cows " Neguvon " is best applied as a wash, for with oral administrations the milk may temporarily acquire a peculiar smell and taste. This presents no difficulty with cows as they are readily available at milking time. This is not so with heifers, the principal carriers of warble fly larvae, for due to their frisky and refractory behaviour they are not always readily available. It is in the treatment of heifers that oral treatment should prove most satisfactory, for to quote Prof. G. Rosenberger* " The novel treatment against warble-fly larvae has the great advantage that it is only applied when the animals are in their stables (November-January). The parasites are destroyed before they have caused the damage for which they are so notorious . . . "

" Unlike with the previous method using derris and soap dressings, the cattle owner is now directly able to recognise the usefulness of the treatment so that his interest in warble-fly control is revived."

When this product is released on the market it will be particularly necessary, in order to obtain the full effect, to follow the instructions very carefully.

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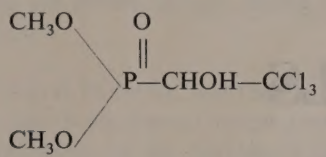
* Prof. G. Rosenberger, A New Method of Warble-fly Control—Successful Treatment of Cattle Against the Migrating Larvae, *Deutsche Tierarztliche Wochenzeitschrift*, 64, 19, 1957.

Chemically " Neguvon " contains the same active agent as " Dipterex," that is 0,0-dimethyl-2,2,2-trichloro-hydroxyethyl phosphonic acid ester.



" Gusathion " acts as a contact and stomach poison to aphids, mites and caterpillars. It is an inhibitor of cholinesterase and has little, if any, systemic action. It is claimed that " Gusathion " does not potentiate the toxicity of any other known organophosphorous compound, nor is it potentiated by any other. It is compatible with Zineb, Captan, TMTDS, Ferbam, DDT and Colloidal sulphur.

" Gusathion " is used commercially in the U.S.A. for the control of certain cotton pests such as Boll Weevil, Pink Boll Worm, Cotton Aphid and Spider Mite. In Germany and Italy it is used on top fruit for the control of Aphids, Spider Mites, Codling Moth and Summer Tortrix Moth.

Research work, carried out in Belgium, has shown that " Gusathion " has a 100% ovicidal effect on the eggs of Codling Moth and Summer Tortrix. It also gave an initial kill of Green Apple Aphid and has a residual effect against this pest for 7 days. It is very effective in controlling Apple and Pear Sucker and also very efficient against Winter Moth giving, even after 13 days following the application, a 70% kill.

From the available information it appears that " Gusathion " will prove to be a very useful material for fruit growers in the U.K. It is a distinct advantage that " Gusathion " not only controls Codling Moth and Summer Tortrix, but simultaneously is also very efficient against Red Spider.

Chemically " Gusathion " is known as 0,0-dimethyl-S (4-oxo-benzo-triazino-3-methyl) phosphorodithioate.

Parts of the Biological Institute at Leverkusen are these greenhouses. Here experiments can be carried out under every possible climatic condition.

SELLING CHEMICALS TO THE FARMER—

by PHILIP HASSAL, *Editor of "The Agricultural Merchant"*

Of the country's 2,500 Agricultural Merchants, 50% are engaged in stocking and selling agricultural chemicals.

A LARGE PROPORTION of the weedkillers, insecticides and fungicides sold to farmers are distributed by the agricltural merchant. The handling of agricultural and horticultural chemicals fits in well with the pattern of the merchant's activities, which include the marketing of home grown cereals, the production and distribution of animal feeding stuffs, the supply of seeds and the distribution of fertilisers and other farm supplies.

In the foreword to a yearbook on agricultural chemicals produced this year by a leading firm of agricultural merchants, the author wrote:

> "Some twelve years ago our company sold its first hundred-weight of Agroxone powder. From that beginning has developed the highly specialised department responsible for producing our yearbook for 1959."

Today this company, which operates in the south-west, stocks and distributes a wide range of chemicals from all the leading manufacturers. It operates its own spray contracting service and organises an aerial spraying service.

This company's development on the chemical side has possibly been exceptional but it has been duplicated to a great extent all over the country by merchants who have seen the economic possibilities, both for themselves and for the farmer, in the extended use of chemical control for weeds, insects and fungi. Of the country's 2,500 agricultural merchants, 50% are engaged in stocking and selling agricultural chemicals and many of these have their own crop spraying service, run directly by the company or, in some cases, by specialist subsidiary companies.

The merchant's interest in weedkillers, and in insecticides and fungicides, is a logical one. In the early days of the trade merchants and millers were interested only in the grain which farmers brought to them and which they ground into flour or sold for feeding livestock. When research into plant breeding necessitated large scale multiplication of improved strains of cereals, merchants quickly entered this field and by trying these new strains and growing them on, both in their own fields and under contract, soon established themselves as seed growers. This has been a continuous and expanding process during the last hundred years, so much so that now virtually all cereal seed bought by the farmer is grown and supplied by the agricultural merchant.

Parallel with this interest in the seed trade has been the part played by the merchant in distributing—and selling—fertilisers. Today nearly all the 4 million tons of fertilisers sold to farmers come through the merchant.

Thus, over the years, a two-way traffic has been built up—the merchant growing or having grown for him, the seed which he sells with the necessary fertiliser, to the farmer, and the farmer, in turn, selling the crop back to the merchant.

It was natural, therefore, that the tremendous developments in crop protection of recent years brought with them added scope for the merchant's energy.

Distributing and selling chemicals was complementary to the merchant's other activities. Here was something to improve the quality and yield of the farmer's crops and, of direct concern, chemicals could and did improve the yields of the grain the merchant bought for the farmer for use in food production or for animal feed. Not least of the advantages, especially of sales of weedkillers, was the improvements they could bring to the cleanliness of the farmer's crops.

Merchants have reacted in different ways to the opportunities offered in selling chemicals. Some have been content to remain solely as distributors, relying where necessary on the manufactures for selling and the giving of advice. Others and especially the larger size firms, have taken the challenge seriously and have organised the chemical side of their businesses. The merchant is the ideal channel of contact if he is trained for the job and runs a special department dealing at once with all the queries that come in.

The merchant's own association, the National Association of Corn and Agricultural Merchants, has also accepted the challenge. The association has a specialist committee, the Agricultural and Horticultural Chemicals Committee, which in turn has a voice in the herbicide parliament of the United Kingdom, the British Weed Control Council, with its various sub-committees. All this means that the N.A.C.A.M. Council is kept in touch with developments, and is in a position to give advice and guidance to its members through circulars and through its journal. Special contact with manufacturers is kept by means of a liaison committee.

The educational side of the trade is looked after by the Institute of Corn and Agricultural Merchants, and in close collaboration with the N.A.C.A.M. Chemicals Committee, courses for young representatives are arranged regularly, in addition to those organised so efficiently by some of the large manufacturers. The Institute's courses on chemicals are among the most popular run by I.C.A.M.

The net result has been the training of a large number of merchant's representatives in the fundamentals of agricultural chemicals. This basic knowledge, backed by specialist advice from the manufacturer, or the firm's directors who have specialised this field, means that the farmer is increasingly being made aware, at the farm gate, of the part chemicals can play in increasing the returns he gets from his crops.

The merchant has his problems in this field. The never-ending increase in new chemicals presents him with the problem of continually keeping up-to-date. Carry-over stocks are another bugbear. It is little wonder here that the merchant who deals with several manufacturers tends to rely on companies who have fair policies when stocks carried over are reduced in price, or become obsolete because of new developments.

Despite these difficulties, the selling of chemicals has come to stay in the merchant's business. Other sources of distribution have been used, but the close contact the merchant has with the farmer has been recognised by the manufacturer who wants a reliable source of distribution for his goods.

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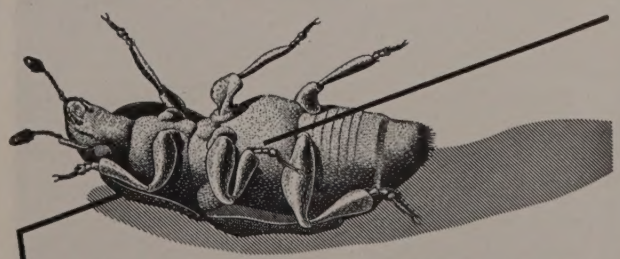

You will of course recognise the importance of this fact. But African Pyrethrum has one other overwhelming advantage—both from the manufacturer's and user's point of view. *African Pyrethrum can be used with a synergist or with other insecticides and still retain its properties.* This means that it is as economical in its use as most others. Further information regarding the many advantages of African Pyrethrum—its knockdown property, non-toxicity to mammals, etc.—and its many applications can be obtained from—

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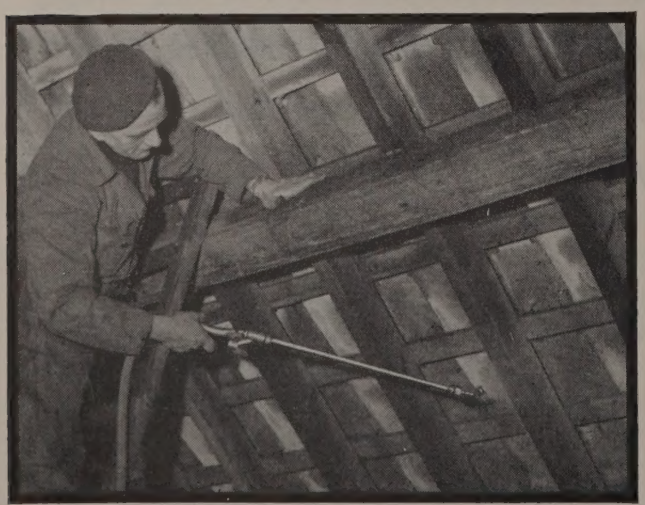

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MEMBERS OF THE BRITISH WOOD PRESERVING ASSOCIATION

Should Local Authorities Undertake Work which is later Inspected by Them?

THE seventeenth annual report of the Industrial Pest Control Association, for the year ending 31st March, indicates the variety of activities of the Association and also the immense amount of work which is undertaken during the year.

The encroachment of local authorities into the farm servicing field, is emphasised in the Report.

" Considerable resentment has been felt during the year among certain members at the encroachment of local authorities into the farm servicing field for rats and mice," the Report observes.

" These members, following discussion with the Ministry, assumed that with reasonable initiative they were likely to obtain much of the work which was being given up by the County Agricultural Executive Committees. In spite of their efforts both in advertising and personal visits, few contracts have been obtained. A good deal of the work has been taken over by local authorities which in many cases have expanded their pest departments to deal with this work. The servicing members feel strongly that this is contrary to the Arton Wilson Report in that the hidden costs of the work are merely transferred from the Central Government to the local authority. Further, since the Prevention of Damage by Pests Act, local authorities have certain duties including the inspection of treated areas, the servicing companies feel that local authorities should not undertake work which is later inspected by them.

"A case was presented to the Ministry during the year and a meeting held. Little satisfaction was obtained. The matter is still under discussion."

The annual general meeting was held on the 5th May.

CROP PROTECTION—

Some Achievments and Future Prospects

by Professor R. L. WAIN, D.Sc., Ph.D. F.R.I.C.
Agricultural Research Council, Wye College.

(*Paper originally read at the 10th International Symposium on Crop Protection in Brussels*)

IF we look back at developments which have taken place in the field of crop protection over the past fifty years, we cannot fail to be impressed. This must not mean, however, that we can be complacent or even satisfied with the progress achieved because the effective control of pests, diseases and weeds is a matter of vital importance in relation to our world food supplies.

At the present time, in spite of the big advances which have been made, especially in chemical control measures, losses of crops due to insect and fungal attack and to weeds are still considerable; even in the more advanced countries they are probably of the order of ten per cent and elsewhere they are often much higher than this. Yet year by year, whilst the area of the world's land surface available for agricultural production is decreasing due to soil erosion, the building of roads, aerodromes and the growth of our towns, the world's population is increasing with alarming rapidity. These factors together, operate in reducing our capacity to produce food and present a basic and vital problem with which all must be concerned. There is no easy solution to this problem but if major catastrophies are to be avoided, it is obvious that all methods which are directed towards increasing the world's food supplies must be pursued energetically. Not only must attention be given to increasing crop yields by proper nutrition, the use of improved varieties and so on, but losses of crops, both in the growth and storage phases, must be reduced to the very minimum. Crop protection then, in all its aspects is a matter of first rate importance; indeed, there are few ways in which an individual can serve humanity better than by devising new and improved methods for protecting crops from pests or diseases or from weed competition.

Fortunately, many workers are now engaged in research in these fields and the older empirical methods are being replaced by planned research in which many scientists and the agriculturist take part. Studies on the toxic action of chemicals on insects, fungi and plants now demands the attention of the physical and organic chemist as well as the mycologist, entomologist and plant physiologist and biochemical investigations, including enzymology, are often no less important. It is right of course that the subject of crop protection should attract its share of the very best scientists for not only are many of the problems in this branch of applied biology as " fundamental " as those in the pure sciences, but as we have seen, on their solution may depend our capacity to produce adequate food. Furthermore, problems in pest and disease control are also rarely solved once and for all; for example, insects which readily succumb to the action of a new insecticide may gradually become resistant to it and varieties of crops bred to resist attack from a particular disease may not remain immune to a new strain of the pathogen. The research worker can never relax; he must not only study the biology of the parasite but keep a close watch on its changing behaviour. We have long passed the stage when the chemist or the biologist can be left to his own devices in this field of work, for in using chemical control to best advantage there must be a full and accurate knowledge of the chemicals used as well as of the biology of the host and its parasites.

It is also becoming increasingly recognised that no chemical can be put to its fullest use until its mode of action has been elucidated. Such studies, of course, take us immediately into the realms of the pure sciences. There are now many indications that, to exert a toxic effect, the chemical must have the right physical properties to penetrate into the organism and adequate stability to move to the site of action within the tissues. At this site of action the series of changes are initiated which lead to the death of the organism. In some cases there is evidence that this can arise from the operation of purely physical factors such as might occur when the toxicant accumulates at a cellular interface, so affecting its permeability and other physical properties. Alternatively, the toxicity may arise from an inhibitory effect of the chemical on a vital enzyme system. All research on mode of action is greatly stimulating but the problems are inevitably complex and they demand a many sided attack with close collaboration between all the scientists concerned.

There are many aspects of crop protection apart from that depending on the use of chemicals but in this brief account I propose to restrict myself to chemical control measures. Much of what I have to say will be familiar to most of you for I now propose to look back at some of the research, particularly British research, which has led to developments of practical importance in this field of crop protection over the past fifty years. In so doing I am not in any way attempting a complete survey and I am well aware that many studies may be omitted from this account which should have been included.

Turning first to the control of plant diseases. In the early years of the century when Bordeaux mixture was becoming established for use on potatoes and vines, E. S. Salmon began his important investigations at Wye College on fungicidal control.[1] At that time it was not the custom to spray against apple scab (*Venturia inaequalis*) in commercial orchards although sulphur sprays were then known. By a series of field trials and careful observations Salmon showed that Bordeaux mixture could give good control of the disease. Over the years he pioneered in the development and use of the few fungicidal sprays which were known to Agriculture at that time. His success in these directions owed much to his collaboration with chemist W. Goodwin and later with H. Martin. This team, together with W. M. Ware, carried out a long series of investigations which appeared under the general title " Fungicidal Properties of Certain Spray Fluids "[2] and these and other publications of theirs dealing with the chemistry and uses of sulphur preparations[3,4] did much to put the agricultural uses of fungicides in England on a proper basis. In the meantime, Pickering at Woburn had begun his important chemical investigations on the fungicidal action of Bordeaux mixture[5] which were to be followed by those of Barker and Gimingham[6] and later by Martin, Marsh, Wain and Wilkinson at Long Ashton.[7]

A wider range of fungicidal materials became available with the introduction of organic substances. Amongst the first of these was salicylanilide which arose from a comprehensive study of fungicidal compounds carried out at the Shirley Institute, Manchester.[8] The properties and uses of many other organic fungicides have been fully investigated in our Government research stations and by commercial firms. British workers have also played a part in the newer study of systemic fungicides. At Wye[9,10] and Long Ashton[9] we have investigated the properties of certain aryloxyalkanecarboxylic acids with promising results whilst at the Ackers Laboratory of Imperial Chemical Industries the antibiotic griseofulvin has received special attention.[11,12] (see also Campbell[13]).

Another approach to systemic fungicides arises from a study of natural disease resistance in plants. There is evidence that in some cases this resistance may have a chemical basis so that where a fungicidal compound can be isolated from a plant, the substance may prove useful as a systemic fungicide in other species. The recent demonstration at Wye[14] that broad bean (*Vicia faba*) seedlings contain a highly active antifungal substance and studies at East Malling on polyphenolic metabolites of apple and pear in relation to apple and pear scab[15] are of considerable interest from this point of view.

Of the various means in which fungicides might find agricultural application, the use of chemicals in the vapour phase does not appear to have received much attention. Such a volatile fungicide, however, might well prove of value, for example, in confined spaces such as the fruit store and the glasshouse. It might be of interest here to mention that at Wye we have found volatile fungicides amongst a number of phenoxythiotrichloromethanes, some of which also possess low phytotoxicity. One of these compounds, (2,4,5-trichlorophenoxythio) trichloromethane has been shown by my colleague, D. M. Spencer, to yield a fungicidal vapour at ordinary temperatures which will prevent infection of lettuce seedlings by downy mildew (*Bremia lactucae*) without causing damage to the plants. The same compound also gave complete protection as a volatile fungicide against *Penicillium italicum* (blue-mould) infection of oranges and good protection to apples (var. Cox's Orange Pippin) against rotting caused by *Gloeosporium spp.* in the fruit store.

Looking back at British developments in the insecticidal field, although we see few spectacular discoveries, there is evidence that much valuable work has been proceeding in our Government and industrial laboratories over a period of many years.

At Rothamsted from 1920 onwards, the activities of Tattersfield and his colleagues J. T. Martin, Harper, Potter and others ranged over a wide field (see Martin[16]). Important contributions were made to our knowledge of the properties and chemistry of the vegetable insecticides rotenone and pyrethrum and it was Tattersfield too, who first began to study the relationships between chemical structure and insecticidal activity. Out of one of these investigations was to come the use of dinitro-*ortho*-cresol in winter washes.[17] In the 1930's much developmental work was carried out at Long Ashton where the results of field trials and laboratory investigations made by Kearns, Marsh and H. Martin, together with those from similar investigations at East Malling, gave the lead to the horticultural industry of Britain in the methods of pest and disease control. Work on standardisation and methods of analysis was also carried out at Long Ashton, tar and petroleum washes[18] and dinitro-*ortho*-cresol[19] receiving particular attention.

In the early years of the war, with the discovery of DDT, a number of entomologists and chemists in Britain turned their attention to this new and spectacular insecticide. From one such line of work carried out by H. Martin and myself[20] on the mode of action of this compound, came ideas which were to guide American workers towards the discovery of a new insecticide " Velsicol 1068 " now known as Chlordane.[21] Meanwhile in the laboratories of Imperial Chemical Industries, important new developments were taking place. These led to the announcement of an outstanding new insecticide benzene*hexa*chloride (BHC)[22] whose insecticidal properties, it later became known, had been independently discovered in 1940 by Dupire in France (see Martin[21]). The British workers showed that of the mixture of isomers present in the crude material, the *gamma*isomer was the most highly active and this was made available in commercial preparations. In the early days, many difficulties had to be met in relation to the use of BHC in the field but these were fully overcome and new uses for the material were found. The high potency of the *gamma*-isomer, together with its fumigant properties, led to the possibility of incorporating this substance in fungicidal seed dressings. A series of field investigations showed that, used in this way, protection against certain soil insects such as wireworms as well as the usual control of seed and soil borne diseases, could be achieved at extremely low cost to the farmer. Indeed, from the agricultural viewpoint, the discovery that certain insecticides can be used in this way must surely represent one of the most important developments of the last decade. Another valuable use for BHC was found to be in termite and locust control; so sensitive is the locust to *gamma*-BHC that it has been said that one gram of the material is capable of killing no fewer than half a million of these pests.[23]

More recent British investigations on insecticides deserving mention here include the research and developmental studies on organophosphorus compounds carried out by such workers as Hartley, Lord, Potter and Read and on summer acaricides by Eaton, Kirby, Higgons and others.

The use of chemicals for weed control has made enormous strides in the past fifteen years, yet for a long time this aspect of crop protection did not receive the attention which was given by the research worker to insecticides and fungicides. Fortunately, the situation has changed and the subject of selective weed control is fast becoming one of the important branches of agricultural science. Specialist workers in the chemical and biological sciences now work closely together within this field and the rapid progress now being made can be expected to continue.

There is little doubt, I think, that the great stimulus to research on selective weed control arose from the outstanding success of the phenoxy acid group of compounds such as 2,4-dichlorophenoxyacetic acid (2,4-D) and 2-methyl-4-chlorophenoxyacetic acid (MCPA). At the present time, these substances are used in such vast quantities all over the world, that they now rank amongst the most important chemicals used in Agriculture.

It would appear that the selective herbicidal activity of the phenoxy acids was arrived at independently by three different groups of workers during the last war. The story of how this came about is well known but it is appropriate here to recall the prominent part played in these investigations by the British workers Slade, Templeman and Sexton at the Jeallott's Hill laboratories of Imperial Chemical Industries,[24] and Nutman, Thornton and Quastel at Rothamsted Research Station.[25] It must not be forgotten here, however, that it was the series of studies by Zimmerman and Hitchcock in the United States which revealed the plant growth-regulating activity of aryl and aryloxy acids. These findings proved to be not only of great value to the British workers but they also stimulated developments at Beltsville and elsewhere which led to the independent discovery in America of the selective herbicidal activity of 2,4-D (see Templeman[26]).

Other notable contributions in the herbicidal field have also been made in England. Compounds derived from phenyl carbamate were shown by workers at Imperial Chemical Industries[27] to be very toxic to grasses and cereals at the germination and young seedling stages. Such chemicals are now finding specific uses in selective weed control.

At the Agricultural Research Council's Unit at Wye College, studies on the mode of action and breakdown of phenoxy acids within plant tissues led to the finding that certain derivatives of these acids might be degraded to yield a potent growth substance in one plant and not in another. This finding has led to the development of the " butyric " herbicides such as ϐ-(2-methyl-4-chlorophenoxy)butyric acid (MCPB) and ϐ-(2,4-dichlorophenoxy)butyric acid (2,4-DB) which appear to exert a unique type of selective action.[28] These compounds are already finding use as selective herbicides in a number of legume crops and the principles underlying their mode of action are stimulating further research in this and related fields.

Another British development was the discovery by Lush[29] and Leafe[30] that the compound ∝ -(4-chloro-2-methylphenoxy) propionic acid (MCPP) will give a control of cleavers (*Galium aparine*) in cereal crops. This weed had hitherto presented a serious weed problem in cereals as it is not controlled by other herbicides of the

plant growth-regulator type. MCPP, which is also effective against a range of other weeds including chickweed (*Stellaria media*), as used, is a mixture of two isomers, only one of which is herbicidally active. In view of the close similarity in chemical structure between MCPA and MCPP, it is interesting to consider why the latter substance should be much more active against a specific weed such as cleavers. The growth-regulating activity of the two compounds as assessed by critical laboratory tests is similar[31] and it is probable that their differences in herbicidal activity arise from differences in those physical properties which affect ease of penetration of the molecule into the plant and its capacity to move in the tissues. Whilst it is unlikely that this is the only factor involved, the case of MCPP shows clearly that modifying the side chain of a phenoxy acid can alter the herbicidal spectrum and this finding may lead to further developments in the field of hormone-type herbicides.

No account of British work on weed control would be complete without reference to the contributions of Blackman, Woodford and their colleagues at Oxford who have not only added to our fundamental knowledge of herbicides but who have, for many years, given a lead to the farmer in the practical use of these materials.

And now I must conclude this survey of some of the contributions made by British workers in the field of crop protection. I am well aware that the account is a sketchy one and very incomplete. Nothing has been said, for instance, about the pioneer work which Fisher did in introducing mathematical statistics into the field of applied biology. Mention should certainly be made of the distinguished teams of workers on plant and insect viruses at Rothamsted and Cambridge. Then the work of Massee on the forecasting of insect attacks from a knowledge of observed changes in insect populations—and that of Large in which, from meteorological data, he is able to forecast attacks of potato blight—all are important contributions in the general problem of protecting our crops against pests and diseases. The control of pests of stored products has also received considerable attention over the years by Munro, Page, and Lubatti and their co-workers at Imperial College, London.

I have said enough, I think, to indicate that in the general progress which has taken place in the field of crop protection in recent years, the British worker has played his part. However, I am sure you will agree that the aim of all who are working within this field is to co-operate to the fullest extent with fellow scientists both at home and abroad. In this connection it is important that, at all levels, there should be the free and willing interchange of ideas which this Symposium seeks to provide.

References

[1]Salmon, E. S. *J. S. E. Agric. Coll., Wye*, 1908, p. 304.
[2]Salmon, E. S. and others. *J. Agric. Sci.*, 1916-1933.
[3]Eyre, J. V. and Salmon, E. S. *J. Agric. Sci.*, 1916, 7,473.
[4]Goodwin, W. and Martin, H. *J. Agric. Sci.*, 1925, 15, 307.
[5]Pickering, S. U. *J. Chem. Soc.*, 1907, 91, 1981; 1988.
[6]Barker, B. T. P. and Gimingham, C. T. *J. Agric.*, 1911, 4, 76.
[7]Wain, R. L. *Chemistry and Industry*, 1946, 7, 70.
[8]Fargher, R. G., Galloway, L. D. and Probert, M. E. *Mem. Shirley Institute*, 1930, 9, 37.
[9]Crowdy, S. H. and Wain, R. L. *Ann. Appl. Biol.*, 1951, 38, 318.
[10]Fawcett, C. H., Spencer, D. M. and Wain, R. L. *Ann. Appl. Biol.*, 1955, 43, 553; 1957, 45, 158.
[11]Brian, P. W. *Ann. Bot. Lond., N. S.*, 1949, 13, 59; *Ann. Appl. Biol.*, 1952, 39, 434.
[12]Crowdy, S. H., Gardner, D., Grove, J. F. and Pramer, D. *J. Exp. Bot.*, 1955, 6, 371.
[13]Campbell, A. H. *VIIIe Jaarlijks Symposium over Phytopharmacie Gent*, 1956, p. 519.
[14]Spencer, D. M., Topps, J. H. and Wain, R. L. *Nature*, 1957, 179, 651.
[15]Kirkham, D. S. *J. Gen. Microbiol.*, 1957, 17, 491.
[16]Martin, J. T. *Science and Fruit*, Univ. of Bristol, 1953, p. 236, 246.
[17]Tattersfield, F., Gimingham, C. T. and Morris, H. M. *Appl. Biol.*, 1925, 12, 218.
[18]Martin, H. *Ann. Appl. Biol.*, 1935, 22, 334.
[19]Batt, R. F., Martin, H. and Wain, R. L. *Ann. Appl. Biol.*, 1944, 31, 64.
[20]Martin, H. and Wain, R. L. *Nature*, 1944, 154, 521.
[21]Martin, H. *J. Soc. Chem. Industry*, 1946, 65, 402.
[22]Slade, R. E. *Chemistry and Industry*, 1945, p. 314.
[23]Stapley, J. H. *Proceedings Fernhurst Crop Protection Conference* 1951, p. 43.
[24]Slade, R. E., Templeman, W. G. and Sexton, W. A. *Nature*, 1945, 155, 497.
[25]Nutman, P. S., Thornton, H. G. and Quastel, J. H. *Nature*, 1945, 155, 498.
[26]Templeman, W. G. *Ann. Appl. Biol.*, 1955, 42, 162.
[27]Templeman, W. G. and Sexton, W. A. *Nature*, 1945, 156, 630.
[28]Wain, R. L. *Ann. Appl. Biol.*, 1955, 42, 151; *VIIIe Jaarlijks Symposium over Phytopharmacie, Gent*, 1955, p. 247.
[29]Lush, G. B. *Proc. IIIrd British Weed Control Conf.*, 1956, p. 625.
[30]Leafe, E. L. *Proc. IIIrd British Weed Control Conf.*, 1956, p. 633.
[31]Fawcett, C. H., Wain, R. L. and Wightman, F. *Ann. Appl. Biol.*, 1955, 43, 342; see also *Ann. Appl. Biol.*, 1953, 40, 232.

" . . . . the most promising pre-emergence treatments . . . . "

EXPERIMENTS IN 1958 WITH PROPHAM AND ENDOTHAL FOR CONTROLLING WEEDS IN SUGAR BEET.

By A. F. Murant,

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Synopsis

Pre-emergence applications of propham, endothal and a propham-endothal mixture were compared in six experiments in 1958 for weed control in sugar beet crops. Both treatments containing endothal gave promising results and controlled a broader range of weeds more effectively than propham alone. No variation was observed which could be attributed to soil type or weather conditions. These results justify further pre-emergence work with endothal and mixtures of it with other chemicals. Foliar applications of endothal in spray and granular form indicated that it is less selective and less reliable for post-emergence use.

Introduction

In investigations since 1952 at the Norfolk Agricultural Station into the use of herbicides in sugar beet only two chemicals of the large number tested have shown promise for the control of broad-leaved weeds. These are propham (IPC) and endothal, which are both also toxic to certain grasses. This property of propham has been known for several years but the range of weeds which can be controlled selectively is restricted. On its own it is likely to be of limited use except possibly for the control of wild oat[1] or if used in conjunction with absorbent carbon placement as suggested by Ripper.[2] Parker[3] reported experiments in 1954 in which endothal had been used pre-emergence to control weeds in sugar beet, with encouraging results. This chemical was again tested in 1957 when it was found that 3 lb. per acre pre-emergence controlled knotgrass (*Polygonum aviculare*) while 10 lb. per acre had no permanent effect on sugar beet. In consequence, endothal was compared with propham in a number of trials in 1958.

This research is financed by the Sugar Beet Research and Education Committee of the Ministry of Agriculture with the objects of finding herbicides which will (a) facilitate and speed up singling and (b) make it possible to take full advantage of precision drills and mechanical thinners by reducing hand work to a minimum.

Materials and Methods

All spray treatments were applied with an Oxford Precision Sprayer applying 25 gallons of liquid per acre at 25-30 p.s.i. Granular material used in two experiments was applied by hand, using a large tin with a " pepper pot " lid. The plots, of 1/100th or 1/200th acre, were arranged in 3-5 randomised blocks. Counts of beet and weeds were made just before singling when the beet had 2-4 true leaves; estimates of beet and weed size (" vigour ") and weed cover were made at the same time by awarding scores on a 0-10 basis. In most cases the crop was subsequently singled so that no further observations on the weeds were possible but in two trials the farmers kindly allowed the plots to be left untouched (neither hoed nor singled) so that the effect of the herbicide could be studied for a longer time. Plant population counts were made in July. Yields will be taken from four trials.

The propham used in these experiments was an oil-water emulsion (CR 1249) obtained from Fison's Pest Control Limited. Supplies of endothal were obtained from the Pennsalt Chemical Co., Washington, and were an aqueous solution (S-3003, now being marketed in the U.S.A. as " Penco Endothal Weedkiller ") and a granular preparation containing 5% endothal on granular Attaclay.

Conclusions

Endothal has insufficient selectivity to be considered as a post-emergence treatment in sugar beet. A granular preparation increased selectivity slightly in one trial but failed in another and it would not appear to be of much value. However, endothal and a mixture of propham with endothal are the most promising pre-emergence treatments for general weed control so far tested on sugar beet at the Norfolk Agricultural Station. The results obtained with endothal in 1958 confirm those obtained by Parker in 1954. The most important weeds which were resistant to 6 lb. per acre of endothal were *Stellaria media*, *Sinapis arvensis*, *Raphanus raphanistrum*, *Chenopodium album* and *Atriplex patula*. Of these, the first can apparently be reduced by replacing some of the endothal with propham and the second and third are among the easiest weeds to control with contact pre-emergence applications. The last two are closely related to sugar beet so that it is unlikely that chemicals having adequate selectivity will easily be found. In view of these factors it is considered that poor control of these weeds is not a very great disadvantage.

Further testing of the endothal and endothal-propham treatments is desirable because much further information is required on their toxicity to various weed species and on their reliability on different soil types and under different weather conditions. The optimum proportions of propham and endothal must be ascertained and mixtures of endothal with other chemicals would probably also repay investigation.

Note: Endothal has a high mammalian toxicity. The " Guide to the Chemicals Used in Crop Protection " by H. Martin, published by the Canadian Department of Agriculture reports an oral LD 50 of 38 mg./kg. in rats. The manufacturers state, however (private communication), that they have satisfied the U.S. Department of Agriculture that when used in accordance with the directions on their label (i.e. pre-emergence at 4-6 lb. per acre) there is no residue of endothal in sugar beet. Care is necessary however in handling the material as it is a skin irritant and may also be absorbed through the skin.

" . . . . germination is stimulated by the cultivations . . . . "

While a reliable general weed control treatment would be welcomed by many growers at the present time to facilitate and speed up hand singling, it will be more important when the use of precision drills and mechanical thinners becomes widespread. In this connection it is important that in one trial some doses of these treatments kept the plots free of weeds throughout the season.

REFERENCES

[1]Murant, A. F. Experiments on the control of wild oats (*Avena fatua*) in sugar beet, 1955-58. *Proc. 4th Brit. Weed Control Conf.*, 1958.

[2]Ripper, W. E. A new method of selective weed control for related plants, in particular broad leaf weeds in beet. *Proc. 3rd Brit. Weed Control Conf.*, 1956, 225-233.

[3]Parker, C. Chemical weed control in sugar beet: a report of experimental work in 1954. *Proc. 2nd Brit. Weed Control Conf.*, 1954, 447-54.

EXPERIMENTS ON THE CONTROL OF WILD OATS (Avena Fatua) IN SUGAR BEET, 1955-58

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Synopsis

The paper is a summary of experiments on the control of wild oats in sugar beet conducted since 1955. Of a range of chemicals tested, TCA has been the most reliable and satisfactory; propham has also shown promise but has given less consistent control. Evidence is presented to show that much of the variability with propham, and to a lesser extent with TCA, can be eliminated by more attention to the time and method of application. It is concluded that if this is done, propham becomes worthy of consideration as an alternative to TCA in many situations.

Introduction

Experiments have been in progress at the Norfolk Agricultural Station since 1952 on the control of weeds in the sugar beet crop and the results of earlier experiments have been communicated to previous Weed Control Conferences.[1,2,3] This paper will review the experiments carried out on the control of wild oats (*Avena fatua*) in the years 1955-58, Mr. C. Parker having been in charge of the work until 1956.

Materials and Methods

In all experiments the chemicals were applied to the seedbed and incorporated into the soil before drilling. An Oxford Precision Sprayer was used, applying 25 gallons of liquid per acre at a spraying pressure of 25-30 p.s.i. Plot size was 1/100th or 1/200th acre and only replicated trials are discussed.

Counts of wild oat and sugar beet emergence were made just before singling (beet in the 2-4 true leaf stage); the trials were subsequently hoed and singled so that no further observations were possible on the wild oats. All sugar beet yield figures therefore represent the effect of the chemical on the crop in the absence of weed competition after the singling stage. Estimates of sugar beet vigour and wild oat cover were made at the same time as the counts by two observers scoring on a 0-10 basis. Plant population counts were made in July or August.

All herbicide dosages mentioned are in terms of acid equivalent.

Discussion

It is probable that the majority of wild oats which infest the sugar beet crop are those whose germination is stimulated by the cultivations which immediately precede sowing. Those which germinate earlier either, naturally or as a result of early cultivations, are probably killed by later cultivations. In practice, little is usually done to the land between ploughing in the autumn or winter, and preparing the seedbed a day or so before drilling. This would account for the significance of the interval between spraying and drilling—it is really the interval between spraying and wild oat germination which is important. Proctor and Armsby[6] discussed the mode of action of TCA and how this is affected by cultivations and time of application. They presumed that it was necessary for the chemical to be present near the wild oat seed when it began to germinate and, this being the case, applications 2-3 week before sowing combined with thorough cultivations would ensure the best chance of success with TCA, which depends upon soil moisture for its movement. It appears likely that dry soil conditions would restrict this movement of TCA but no clear evidence to this effect has been obtained.

Propham differs from TCA in being highly insoluble (32 ppm at 25°C.) and in having appreciable volatility. It is presumably able to spread through the soil in vapour form and will therefore reach the wild oat seed more quickly than TCA so that it may be applied later. Further, if applied too soon much of the chemical will have evaporated from the soil by the time the wild oats destined to infest the crop are germinating. Timely incorporation will apparently reduce this loss but will not prevent it entirely. It is to be expected that propham will not be very dependent upon soil moisture but its diffusion through the soil might be reduced under extremely wet, cold conditions. These have not been experienced so far, but might be a possible cause of occasional crop damage or poor wild oat control in the future.

The choice of TCA by Holmes and Pfeiffer as being the most reliable chemical for the control of wild oats has been borne out by the results of this work. However, TCA has certain disadvantages in use, two of which are:

"Annual Weed Control in Established Asparagus with Monouron" and "Weed Control in Various Fodder and Vegetable Crops with S.M.C.A." published in our April issue were Abstracts from the 4th British Weed Control Conference.

1. The necessity to apply it and work it thoroughly into the soil 2-3 weeks before drilling. Farmers like to make their earliest sowings of sugar beet as soon as the land is fit and this precludes the most efficient use of TCA on the earliest fields. It is also undesirable to cultivate the soil more than absolutely necessary before sowing because of the risk of losing moisture from the seedbed; the majority of complaints received from farmers about the use of TCA in the dry season of 1957 were concerned with this point.

2. The fact that it gives little control of broad leaved weeds.

Propham may well be a useful alternative to TCA in many situations. It can be applied during the process of seedbed preparation and thus involves no more cultivation than would normally be performed. If applied at this time it would give a level of control of the same order as TCA. It has the further advantage of being toxic to a number of important broad-leaved weeds, notably knotgrass (*Polygonum aviculare*) and other Polygonaceae, and chickweed (*Stellaria media*).[2,4] Its use would therefore appear to be justified in the following situations at least: early drilled crops; on land where susceptible broad-leaved weeds are also important; and in seasons when it is important to conserve moisture in the seedbed.

REFERENCES

[1]Parker, C. Experiments with various pre- and post-emergence chemical treatments for weed control in sugar beet. *Proc. 1st Brit. Weed Control Conf.*, 1953, 274-81.

[2]Parker, C. Chemical weed control in sugar beet: a report of experimental work in 1954. *Proc. 2nd Brit. Weed Control Conf.*, 1954, 447-54.

[3]Parker, C. The results of laboratory tests with herbicides for pre-emergence use in sugar beet, with particular reference to *Avena fatua*. *Proc. 3rd Brit. Weed Control Conf.*, 1956, 95-107.

[4]Murant, A. F. Experiments in 1958 with propham and endothal for controlling weeds in sugar beet. *Proc. 4th Brit. Weed Control Conf.*, 1958.

NEWS

In an address to the Agricultural and Food Chemistry Division of the American Chemical Society at the Society's 135th National Meeting held at Boston on 8th April, the Society's president-elect, Dr. Albert L. Elder, Director of Research of the Corn Products Company, Argo, Ill., said; " Crop protection depends not only upon the weather and fertiliser but upon the control of the various pests that may devour the crop. Even after the crops are harvested, insect losses on stored crops are over 300 million dollars a year. The time will come when we cannot afford and will not tolerate this luxury. Grain fumigants are available today which will protect stored crops. Forced-ventilation bins are growing in use because of their quicker and more efficient use of fumigant as well as better assurance of elimination of toxic vapours before the grain is used.

" Even more costly than they do to stored grains are insects' depredations on growing crops. An insecticide thrown into the battle should be effective in killing insects and should not have an adverse effect on the plants growing in the soil. The crops, when harvested, should contain no more than tolerable quantities of the residues.

" It costs from 740,000 to 3,000,000 dollars to develop a successful pesticide, but perhaps in the future it may be possible to predict with more accuracy which compounds will be useful and safe from the structure of their molecules.

" One of the interesting developments in this field is the use of non-toxic silica gel, which acts by absorption of the insects' protective wax coating and causes dehydration. There is also hope that further development of techniques for sterilising insects could be more effective on a cost basis than outright killing."

Dr. Elder emphasised the point that a " terrific educational programme " was needed for the proper use of some of the new chemicals in the insect battle, explaining that chemicals are often misused because the many recommendations are confusing to the farmers.

" It is almost impossible to predict where a major pest outbreak will occur," Dr. Elder continued. " Often the time lag between field survey and government report makes the information only history. The use of computing machines and rapid relay of information as part of over-all inventory control is quite likely to play a more important role in the future in decreasing crop losses caused by plant diseases."

Regional Controller—West Midland Region

Mr. W. J. B. Hopkinson, O.B.E., who had been the Ministry of Agriculture, Fisheries and Food Regional Controller in the West Midland Region since April, 1957, will take up a post at the Ministry's headquarters on 1st May, 1959.

He will be succeeded by Mr. G. H. C. Amos. Mr. Amos entered the Civil Service in 1931 and was transferred from the Board of Trade to the Ministry of Food at the outbreak of war. He has served in a number of divisions at headquarters and has acted as Secretary to a number of inter - Departmental Committees. From 1956-58 he served in Ottawa as Agriculture and Food Adviser to the United Kingdom High Commissioner in Canada.

In reading the Auditors' Report on the Accounts to the 54th Annual General Meeting of The British Cotton Growing Association held on 7th April, 1959, Mr. Stafford of Messrs. David Smith, Garnett & Company stated, " In the Republic of Sudan the crop of Sakel and Lambert type cottons was, last year, a disastrous failure due to a most unfortunate combination of unfavourable weather and the incidence of insect pests and blights, which continued throughout the growing into the harvesting period, reducing the yield to a fraction of what is normally expected;" Mr. Stafford also stated that " in Nyasaland headway is hard to make, although much is being done to come to grips with the problems of plant diseases and pest control which are the chief causes of poor yields there."

NEWS

African Pyrethrum — New Research and Sales Drive

France has been chosen by the African pyrethrum industry centred in Kenya, Tanganyika and Ruanda Urundi, for its latest sales and promotion drive for this important natural insecticide.

A special committee (COFAP) of leading French research scientists and industrial chemists has been established in Paris with the aim of making better known to French industry and the public the wide range of uses to which pyrethrum can be put.

This move follows the establishment in London last year, with additional representation in Milan, of the African Pyrethrum Technical Information Centre Ltd. (APTIC) and inauguration in Western Germany of a special sales campaign.

The Comite Francais pour l'Etude des Applications des Pyrethrines (French Committee for the Study of the Uses of Pyrethrins) to give COFAP its full name, set itself at its inaugural meeting the following specific tasks:

1. Prompt distribution to those concerned in the French chemical industry of all new facts about more efficacious uses of pyrethrum.

2. With the interests of public health in mind, encouragement of research into the use of pyrethrins (the toxic constituents found in the centre of the pyrethrum flower at a certain stage of ripeness) in the light of pyrethrum's low toxicity for warm-blooded creatures.

3. Encouragement of research into the discovery of types of pyrethrum formulations harmless to useful entomological fauna.

Present at COFAP's inaugural meeting was M. Roland Mange, a grower member of the Pyrethrum Board of Kenya which controls the production and sale of the Kenya crop. Also present were T. F. West, D.Sc., European Operations Executive of APTIC and Mr. R. H. McLellan, APTIC Technical Representative based in Milan.

Elected President of COFAP was Professor Rene Truhaut of the Toxicological Laboratory of the Sorbonne Faculty of Pharmacy, and Dr. Jean Lhoste, Technical Director of the big PROCIDA Company, was elected Honorary Secretary.

M. Mange and the Paris representative of Messrs. Cooper, McDougall & Robertson, Mr. Michael Lis, were elected members of COFAP's advisory board.

Fowl Pest in South-west Lancashire

Since 16th April, seven outbreaks of fowl pest have occurred around Ormskirk, Lancashire. In order to guard against the possible spread of infection to other districts, the part of Lancashire round Ormskirk and extending from Up Holland in the east to Southport in the north-west has been declared an Infected Area by the Minister of Agriculture, Fisheries and Food under the Fowl Pest (Infected Areas Restrictions) Order, 1956.

The restrictions come into force from 25th April. Poultry may not be moved into, out of or within the Infected Area except under licence. The holding of poultry store markets in the Area is prohibited.

Poultry keepers are advised to keep a close watch on the health of their flocks and to report any suspicious symptoms to the police immediately.

Six of the outbreaks have occurred in the parish of Lathom and the seventh one in the parish of Burscough.

The infected area comprises the county borough of Southport, the parishes of Aughton, Bickerstaffe, Burscough, Downholland, Halsall, Lathom, Lydiate, Maghull, Melling, Ormskirk, Scarisbrick, Simonswood and Skelmersdale in the Petty Sessional Division of Ormskirk and the parishes of Dalton, Parbold and Up Holland in the Petty Sessional Division of Wigan.

Insecticide by Air Express

Recently an aeroplane of the Swiss Air Lines left London Airport carrying a cargo of highly concentrated insecticide especially formulated for the Government of Jordan by Standardised Disinfectants Co. Ltd.

The order, which was of considerable value, was finally confirmed on a Friday morning and the product was manufactured and despatched from London Airport on the following Tuesday.

Insecticide by Air Express

News and New Products

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The London Fumigation Company Limited, have received instructions to carry out the fumigation with Methyl Bromide of the Round Tower, Windsor Castle. The Round Tower has an infestation of death watch beetle.

Warble Fly

The Warble Fly dressing season began on 15th March.

Stock-owners are reminded that the regulations (*see Note* 1) require that infested cattle should be dressed at monthly intervals commencing next week, or as soon after this as warbles appear under the skin, and continue until 30th June or until maggots cease to appear, whichever is the earlier. Any approved derris dressing may be used, and it should be scrubbed into the affected parts of the hide with a stiff brush. It will be necessary to pay particular attention to the inspection of long-haired cattle where infestation can often only be detected by touch, and to outlying stock.

Notes for Editors:

1. The Warble Fly (Dressing of Cattle) Order, 1948.
2. A report published in May, 1957 by the European Productivity Agency of O.E.E.C. on organisation of control of warble fly infestation in cattle states that warble fly can cause considerable loss of live weight accompanied by substantial lowering of milk production and hide value. It is estimated that approximately £24.5 million in meat and milk losses and £3 million in hide losses is caused each year in Europe by the fly. These losses arise partly through the disturbance of grazing cattle by the fly when laying its eggs, but the major portion is caused by the toxic effect of the grubs during their migration through the animal's body.

Stafford Allen & Sons Ltd., have introduced a new synergised pyrethrum extract to be known as " Pyractone " with BCP. They state that " Pyractone " is a concentrated extract containing 5% of Pyrethins synergised with 25% of the new Stafford Allen product " Bucarpolate " (BCP) which increases the insecticidal effect five-fold. "Pyractone " is normally diluted by insecticide manufacturers at the rate of 1 in 250 of deodorised kerosene, giving 0.02% pyrethrins in the finished spray. This is equivalent in "knock-down" power to a plain pyrethrum extract diluted to contain 0.1% pyrethrins. Chemically it is the ester of piperonylic acid with the mono n-butyl ether of diethylene glycol. In all tests " Bucarpolate " has proved the most effective known means of enhancing the unique insecticidal properties of pyrethrum and so reducing cost.

The problem of staining has now been almost entirely eliminated. It is also suggested that " Pyractone " is ideal for aerosols.

New Zineb Fungicide

It is announced that supplies of a new zineb fungicide, " Shell Zineb " will be available from Shell Chemical Company Limited from April onwards.

This fungicide is primarily for the control of blight on potatoes, but it is also suitable for horticultural use and will control many diseases of market garden crops. For the early control of potato blight, " Shell Zineb " localises centres of infection, and, if properly applied, should prevent the rapid spread of the blight.

For aerial application on potatoes, the recommended rate is 2 lbs. of " Shell Zineb " in 1 to 2 gallons of water per acre. In a land spraying machine, 2 lbs. of " Shell Zineb " should be applied in 25-100 gallons per acre.

" Shell Zineb " is in the form of a fine wettable powder and is available through the company's Appointed Distributors in 2 lb. and 10 lb. bags and 110 lb. drums.

The 1959 Catalogue and Price List of Cooper, Pegler & Company Ltd., Burgess Hill, Sussex, includes a number of new machines which have been introduced during the past six months, these include: The "Falcon" Pneumatic Knapsack Sprayer, a fifteen foot Aluminium Telescopic Lance, also, new lances, nozzles, a spray gun and a T boom.

There are some completely new introductions which have only been available since March. They are: The " Hurricane " Knapsack Power Driven Mist Blower and Duster and The Instantaneous Control Lance.

In their " Data and Applications Manual " upon " Courlose," British Celanese state that F750 of the salt free and pure grades of sodium carboxymethyl cellulose (SMCA) distributed by J. M. Steel & Co. Ltd.,

> " may be used with advantage to stabilise dispersions of fungicides and insecticides for employment as sprays. The " Courlose " also serves to bind the active constituents on drying, thus increasing their effective life on the plant."

Silver Creek Precision of Colnbrook, Bucks., have issued brochures describing several new Microsol Fog Generators. These models include: model 202, with an output of 0-3½ galls./hour, tank capacity 3¾ pints and particle size control of 5-60 microns; model 202 special, with an output of 0-4 galls./hour, tank capacity 4 pints and particle size control 5-60 microns; model 303T, with an output of 0-25 galls./hour, tank capacity 5 gallons, a throw of 165 feet and particle size control 10-120 microns; model 304, with an output of 0-45 galls./hour, tank capacity 6 gallons, a throw in still air of 150 ft. horizontal and 80/90 ft. vertical and a particle size control 20-150 microns. These machines were exhibited at the Royal Society of Health Congress at Harrogate.

PUBLICATIONS RECEIVED

Murphy Fruit Growers Booklet 1959.
Issued by The Murphy Chemical Co. Ltd., Wheathampstead, St. Albans, Herts.

The introduction reviews the 1958 season, and stresses the success of Karathane as the most efficient control for Mildew, the value of Phenkaptone (Murphy Phenatol) and the new contact systemic insecticide Rogor 40 are also shown as having proved outstandingly efficient in the control of Red Spider.

The booklet gives a comprehensive account of pest and disease control for the commonly grown fruit crops and also includes chapters on " Low and High Volume Spraying," " Rats and Mice " and " Spraying Do's and Don'ts."

As with previous Murphy Booklets the Fruit grower will find this publication very useful.

The Murphy Chemical Company Limited, of Wheathampstead, Herts., have produced several new leaflets and one which is of particular interest is that dealing with the control of red spider in orchards.

A full list of available leaflets may be obtained by writing to the Company.

Selective Weedkillers.
Published by Bayer Agriculture Ltd.

This booklet replaces the three previous leaflets on " Akodrin," " Buterex " and " Weedol," and the latest recommendations for these products in a more convenient form.

Bayer Agriculture state, " In recent years the choice of weedkillers for normal farm use has widened rapidly; users are often bewildered by the large number of chemicals available and the many different brand names under which they are sold. In the interests of simplicity, the Bayer range has been kept to the three basic weed sprays of modern farming. All are safe to the user, livestock and wild life, they are applied at low volume, and they give the widest possible margin of crop safety consistent with effective weed control in cereals, pastures and certain other crops."

Copies of the booklet are available on request.

Sports Turf Bulletin, No. 45. April-May-June, 1959.
Issued by The Sports Turf Research Institute, Bingley, Yorkshire.

As in previous issues this bulletin will be of interest to anyone working in this field.

Catalogue and Price List for 1959.
Published by Cooper, Pegler and Co. Ltd., Burgess Hill, Sussex.

Could be worth looking at for anyone thinking of buying new spraying and dusting machinery.

Alderstan and Dilstan. Technical Information Sheet No. 3/7.
*Issued by The Standardised Disinfectants Co. Ltd., 23 Sloane Street, London, S.W.*1.

Contains information with regard to the applications of " Alderstan " and " Dilstan " required for the control of various pests and the precautions to be taken when they are applied.

Pocket Guide.
Issued by I.C.I.

Handy " on-the-spot " guide to crop troubles and their remedies.

Open Door to Plenty.
Published by the National Agriculturals Association 1145, 19*th Street, N.W., Washington* 6, *D.C.*

As the introduction states " ' Open Door to Plenty ' tells the story of man's struggle to control some of the hostile elements in the world around us. These are pests which destroy our foods and our property, and attack our health.

Research and education, the twin mainsprings of human progress, have been encouraged consistently by the National Agricultural Chemicals Association to improve man's mastery over these pests.

" This booklet reviews progress which has been made and reports on future benefits we can expect as research and education are continued in this vital field of human endeavour.

" ' Open Door to Plenty ' is designed to present the basis for a general understanding of the role of agricultural chemicals in the protection of our foods, our property and our health today."

The fact that this booklet is propaganda is not detrimental to the value of the book as it contains some of the information required to allay the fears of the general public with regard to the use of pesticides.

The book shows how the use of agricultural chemicals began, their advantages, the laws regulating agricultural chemicals and the precautions taken to ensure the safety of agricultural chemicals.

There is also a chapter which shows how pesticides can be used for the benefit of wildlife.

This book is naturally aimed at the general public and for anyone who has any interest in the use of agricultural chemicals it is worth having.

Individual copies can be obtained free of charge from the National Agricultural Chemicals Association.

Putting Profits into Colorado Farming and Ranching.
Published by the Colorado Bankers' Association in co-operation with Colorado State University.

Described as " An attractive 20 page brochure " and " Liberally illustrated and crammed with information about fertiliser economics, the booklet is designed ' to show how and why the wise use of commercial fertiliser in conjunction with other practises recommended by Colorado State University can increase farm profits.' " by its Editor, it is attractive and liberally illustrated but *not* ' crammed with information.'

Plant Food Review. Vol. 4, No. 4.
Published by National Plant Food Institute, 1700 K Street, N.W., Washington 6, *D.C.*

Written in typical American style this journal includes such items as " Cash in on Grass," " High Speed Electronic Computer—' New Farm Hand ' " and " Where Do Farmers Get Their Fertiliser Facts." It may be of interest to any one who would like to compare British and American attitudes to farming.